PROGRESS OF THE BARBERRY ERADICATION CAMPAIGN IN NORTH DAKOTA, 1928.

By George C. Mayoue, Associate Pathologist 1/

Office of Cereal Crops and Diseases, Bureau of Plant Industry

U. S. Department of Agriculture

Introduction

Black stem rust is the most destructive disease of the small grains, destroying annually millions of bushels of grain. It is estimated that in North Dakota alone from 1915 to 1928, inclusive, more than 222,950,000 bushels of wheat, oats, barley, and rye, with a yearly total average of more than 15,925,000 bushels of these grains, have been destroyed by this disease. Even though the stem-rust loss in North Dakota during the season of 1928 is the smallest annual loss from this disease on record, it claimed a toll of approximately 1,150,000 bushels in this State.

Barberry eradication as a means of controlling black stem rust was inaugurated in North Dakota in the spring of 1917, following the passage of the State law compelling the destruction of all rust-spreading barberries. It never has been necessary to enforce this law, because property owners have cooperated willingly in the destruction of their barberries.

In 1918 the Office of Cereal Crops and Diseases, Bureau of Plant Industry of the U. S. Department of Agriculture, took charge of the campaign against the common barberry in cooperation with the 13 north-central wheat-growing States, namely, Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. The following year a Federal quarantine was established to prevent the transportation of the harmful barberries into the area where the barberry campaign was in progress.

The campaign in this State is directed by a State Leader under the supervision of the U. S. Department of Agriculture, in cooperation with the Agricultural College, the State Department of Agriculture, and other State and civic organizations. The Conference for the Prevention of Grain Rust, Minneapolis, composed of representatives of agricultural and allied interests, cooperates closely with the project. The Greater North Dakota Association, the North Dakota Retail Merchants Association, the State Bankers' Association, as well as the State Departments of Agriculture and Public Instruction, and the different departments of the Agricultural College, especially the Extension Division and the Experiment Station, are the leading cooperating agencies in this State.

1/State Leader of Barberry Eradicaton in North Dakota

From April, 1917, to December 31, 1928, more than 26,000 barberries in North Dakota and more than 17,500,000 in the general campaign extending over the 13 States mentioned, have been found and destroyed. In addition to the number of bushes located by Federal and State agents in North Dakota and other States, thousands of bushes of which no records were made were voluntarily eradicated. It is estimated that approximately 10,000 bushes of which no records were obtained were removed by the property owners and tenants of North Dakota, particularly in the first years of the campaign.

Financing

This project is financed almost entirely by Federal funds. North Dakota appropriated $5,000 in 1917 and $15,000 in 1923, making a total of $20,000 furnished directly by the State. The Conference for the Prevention of Grain Rust, Minneapolis, the Greater North Dakota Association, the North Dakota Retail Merchants Association, and other organizations have contributed direct as well as indirect aid to the campaign. It is estimated that the cost of the campaign during 1928, the year having the smallest stem-rust loss on record, is a little less than 2% of the value of the grain which was destroyed.

Surveys

The preliminary survey of the State was completed in 1924. The purpose of this survey was to destroy the largest number of bushes in the shortest possible time. Therefore, it was conducted by a less intensive method, and only the large and more conspicuous bushes, hedges, and clumps of bushes were found. In 1923 the appearance of local epidemics was traced to bushes found in areas which had been covered by the preliminary survey. As a result, a second survey, more intensive than the first, has been conducted each season since that time. Many remaining bushes have been found, in addition to new bushes which had grown from seeds scattered from planted barberries by birds and other agencies. During 1928, Adams, Kidder, and Pierce Counties were covered in this survey. In 1926, local stem-rust outbreaks occurred in areas which had been twice surveyed, and in the course of a third very intensive survey the guilty bushes were found. During the past three years limited areas where the amount of stem-rust infection quite definitely pointed to near-by barberries have been covered a third time, with the result that a number of new bushes originating from seeds as well as bushes which had grown up from sprouts have been located. Portions of Traill and Grand Forks Counties were surveyed a third time this year (1928) and two large bushes in addition to 530 seedlings were found ranging from 4 to 10 inches in height.

Resurveys are reinspections of the properties on which barberries have been found and destroyed. It is highly important to make resurveys in order to locate and kill any sprouts or seedlings that have appeared where bushes were destroyed in previous surveys. In many cases, however, the inspections are probably no longer necessary on properties where original bushes which

did not bear fruit were destroyed with the application of salt and where no sprouts or seedlings have been found for a period of four years. Considering the fact that barberry seeds may lie in the ground seven or more years before germinating, locations where fruiting bushes have been found must be closely observed for the appearance of seedlings, which also are very good spreaders of rust and which in a few years will be producing seeds. Reinspections in 1928 were carried on in portions of nine counties. In all surveys of this year, including second survey, third survey, and resurveys, 773 barberries were found and destroyed. The area completed was equivalent to approximately 6% of the area of the State.

There still remains a big job to be done. Approximately 30 counties require intensive second and third surveys in addition to several reinspections which will be necessary for some of the escaped properties and for properties where the bushes could not be treated with salt because of the danger of killing near-by shrubbery and trees. This means that the final destruction of all the bushes will require a long time -- just how long no one knows. But the campaign must be continued. Should the remaining seedlings and sprouts as well as planted bushes be permitted to grow, they would increase rapidly, and in a decade or so much of the work accomplished would have been undone. If the barberry eradication campaign had not started when it did, and the bushes had been permitted to continue to increase rapidly, small grain would soon have become a thing of the past. The inspections require the searching of every foot of all farmsteads, deserted farms, windbreaks, groves, cemeteries, city and town properties, parks, natural timber, and other places where these bushes might be found. The problem of locating all of the barberries is a difficult task and requires a great deal of time.

Summary of Other Activities

In addition to the surveys, stem-rust studies were carried on over the State observing the development and severity of this disease. Through these field studies records were made of the places where the local infection indicated near-by barberries. These records will be used in determining the areas to be surveyed the coming season. Similar records made in the past have afforded invaluable leads to those bushes.

The publicity and educational activities are very important phases of the project. A total of 64 news stories were released to daily and weekly papers during the year. It is estimated that approximately 450,000 people were reached through the press. One hundred twenty demonstrations were made at fairs, in the field, in schools, and at various meetings of State and civic organizations. Materials for study were sent to 3,000 schools and colleges; 2 radio talks were made; a speaker was supplied to 15 meetings; and 26,500 circular letters in addition to 40,000 packets containing circulars, bulletins, plates, specimens of common barberry, etc., were distribured to teachers, students, farmers, and business men throughout the State.

One Barberry Produces Tremendous Amount of Rust

The question is often raised why a few barberry bushes in North Dakota can cause such tremendous damage over a comparatively large area. By actual count it has been calculated that a single average-size bush, 6 or 7 feet high, produces in one crop more than 64,000,000,000 spores, which is about thirty-eight times the population of the world. Several successive crops of spores may be produced in a season. These spores can infect grasses and grains and in turn produce an amazing amount of infection every 7 to 10 days throughout the growing season, depending upon the weather. In an open prairie State like North Dakota it is quite easy to understand how the winds can spread these vast numbers of rust spores over great areas in a short time.

Destroying Barberries

Barberry bushes are eradicated by two methods, namely, by digging, and by chemical means through the application of salt. In this State, however, the latter method is by far the most effective and is used in every case excepting those few in which the application of the chemical, salt, is likely to kill near-by valuable vegetation.

Barberries Traced from Infection in the Fields

In the first years of the campaign it was impossible to differentiate between the local stem-rust epidemics caused by infected barberries and the more widespread general epidemics. Since millions of the bushes have been destroyed in the entire barberry area, the number of local epidemics has been greatly reduced so that rust spreads from a single bush or a few bushes can be much more easily distinguished.

In 1923 for the first time, barberry bushes in North Dakota were found by tracing out the early infection in near-by fields. In each of the following years plantings have been located by tracing them through local epidemics. This year one of the outstanding rust spreads from barberries traced from infection in fields was located in Bentru Township near Reynolds in Grand Forks County. It is estimated that more than 500 people from Grand Forks and Fargo, as well as from neighboring towns and rural communities, visited that location and saw for themselves the rust spread. Some very good publicity was given to this find by the leading newspapers of the State. Following is one of the articles which was on the front page of the Fargo Forum under date of August 4:

CASS COUNTY MEN CONVINCED BARBERRY IS RUST SPREADER

Group Finds Concrete Evidence in Fields near Reynolds.

After inspecting a spread of black stem rust from common barberries to nearby grasses and surrounding grain fields near Reynolds, Friday, a group of Fargo business men and Cass County farmers expressed themselves as convinced that the common barberry is the important factor in the spread of stem rust to the wheat fields of North Dakota.

The party, composed of Morton Page, W. P. Chestnut, secretary of the Fargo Chamber of Commeroe, Roy Johnson, Casselton, Albert Sinner, Casselton farmer, E. A. Calhoun, Cass County extension agent, and Joyce Roberts, agent for the barberry eradication campaign, left Fargo early Friday morning, returning in the afternoon. The group first inspected hard wheat fields as far as 10 miles northwest of the barberries and found only a trace of rust infection there. Wild barley, commonly called foxtail, growing 100 yards from the barberries, was found to be literally rotten with the black stem rust infection. The spread of rust was easily traced through hard wheat fields several miles to the south and east.

Infection Traced

A heavy infection in a field of Marquis on the Linde farm was traced directly to the barberries three miles to the northwest. Other fields in the same vicinity and south also were found to be heavily infected. In explaining the rust spread, Mr. Roberts pointed out that all local rust epidemics which have been observed this season in North Dakota, South Dakota, and Minnesota, have been in a southeasterly direction, because of the northwestern winds which prevailed at the time the rust spores were being spread by the barberry bushes. This was clearly demonstrated when hard wheat fields three miles to the southwest of the bushes were found to have only a slight infection of rust.

Albert Fosberg, tenant on the farm where the barberries were located, stated that because of rust losses in the hard wheats he had planted no Ruby or Marquis this season. Several farmers who were interviewed said that the rust in that section has always damaged their crops. However, because of the weather which has been unfavorable for the development of rust the fields probably will escape serious damage this season.

Conclusive Proof

In commenting on the demonstration, Mr. Johnson said: "The spread of rust from these bushes is conclusive evidence that the common barberry is an important factor in the dissemination of black stem rust. I believe that every effort should be made to cooperate in its eradication."

E. A. Calhoun stated on the return trip: "This practical demonstration of a rust spread has convinced me that the common barberry does spread black stem rust. The infection several miles from these bushes is heavier than anything I have seen in Cass County this year."

W. P. Chestnut and Albert Sinner heartily agreed with Morton Page in his statement that "the fact that the rust has so clearly spread from the barberries to the grasses and then to the neighboring grain fields ought to demonstrate to the most careless observer that there is more to the control of black stem rust by barberry eradication than many people have been wont to believe."

The inspection of this rust spread was decided upon Thursday afternoon following a statement made here by Dr. H. B. Humphrey, pathologist in charge of the United States Department of Agriculture rust investigations, who characterized the spread as a most conclusive proof of the part played by the barberry in spreading black stem rust. The location of these bushes is on the S. W. 1/4, Sec. 19, Bentru township, two and one-half miles north and six miles east of Reynolds.

Other Kinds of Grain Rusts

In addition to black stem rust, which attacks wheat, oats, barley, rye, and many of the wild grasses, there are rusts entirely distinct from black stem rust. They have no relation whatever to the barberry and black stem rust. They are known in general as leaf rusts and have the red and black stages, which causes many people to confuse them with black stem rust. There also are rusts on many wild and cultivated plants, such as wild roses, willows, goldenrod, wild licorice, and many others. These rusts are entirely different from black stem rust and have nothing whatever to do with it.

Conclusion

Since it is positively known that the common barberry is a spreader of black stem rust, every man, woman, and child should become familiar with its identification and should put forth every effort to locate and destroy it. Whenever a shrub is located which is believed to be common barberry, a sample should be sent for identification to the Barberry Eradication Office, State College Station, Fargo, North Dakota.